

## CLAIMS

1. A polymer concrete formulation comprising:
  - an amount of polymer resin;
  - an amount of thixotrope;
  - 5 an amount of a light aggregate with a specific gravity less than that of the resin; and
    - an amount of a heavy aggregate with a specific gravity larger than that of the resin.
2. The polymer concrete formulation of claim 1 wherein the 10 polymer resin is any suitable polyester, vinylester, epoxy or polyurethane resin or combination of resins.
3. The polymer concrete formulation of claim 1 wherein the polymer resin content is between 25-30% by volume.
4. The polymer concrete formulation of claim 1 wherein light 15 aggregate has a specific gravity of 0.5 to 0.9.
5. The polymer concrete formulation of claim 1 wherein the light aggregates usually make up 20-25% by volume of the polymer concrete.
6. The polymer concrete formulation of claim 1 wherein the light aggregates are centre spheres.
- 20 7. The polymer concrete formulation of claim 6 wherein the centre spheres has a specific gravity of approximately 0.7.
8. The polymer concrete of claim 1 wherein the light aggregate is hollow glass microspheres.
9. The polymer concrete of claim 1 wherein the heavy aggregate 25 makes up 40-60% by volume of the polymer concrete.
10. The polymer concrete of claim 1 wherein the heavy aggregate is basalt.
11. The polymer concrete of claim 10 wherein the basalt is crushed.
- 30 12. The polymer concrete of claim 10 wherein the basalt has a particle size between 5 to 7 mm.
13. The polymer concrete of claim 10 where the basalt makes up

between 40-50% by volume of the polymer concrete.

14. The polymer concrete of claim 10 wherein the basalt has a specific gravity of approximately 2.8.

15. The polymer concrete of claim 1 wherein the heavy aggregate is sand having a specific gravity of approximately 2.8.

16. The polymer concrete of claim 15 wherein sand makes up between 50-60% by volume of the polymer concrete.

17. The polymer concrete of claim 1 wherein the heavy aggregate is made up of one or more of coloured stones, gravel, limestone, shells or glass.

18. The polymer concrete of claim 1 wherein the amount of thixotrope is between 0.5% to 1.0% by weight of the resin.

19. The polymer concrete of claim 1 wherein the thixotrope is fumed silica.

15 20. The polymer concrete of claim 1 also including fibrous reinforcement material.

21. The polymer concrete of claim 20 wherein the reinforcement material is one or more of glass, aramid, carbon, timber and/or thermo plastic fibres.

20 22. A method of forming a structural element using polymer concrete, the polymer concrete having an amount of polymer resin, an amount of thixotrope, an amount of a light aggregate with a specific gravity less than that of the resin; and an amount of a heavy aggregate with a specific gravity larger than that of the resin, the method including the steps of:

choosing an amount of resin;

choosing an amount of thixotrope;

choosing an amount of light aggregate to obtain the desired viscosity of the resin-light aggregate mix

30 choosing an amount of heavy aggregate to form a desired thickness of a lower layer within the structural element;

mixing the resin, thixotrope, heavy aggregate and light

aggregate together to form polymer concrete;

locating the polymer concrete in a mould;

allowing the polymer concrete to settle to form a first layer and a second layer of different consistency within the structural element;

5 removing the structural element from the mould.

23. The method of claim 22 wherein reinforcement members are located within the polymer concrete after the polymer concrete has settled.

24. The method of claim 23 wherein the reinforcement members are located in the second layer of the structural element.

10 25. The method of claim 24 wherein the reinforcement members have a series of apertures located through the reinforcement member to allow resin and light aggregate to pass through the apertures.

26. The method of claim 23 wherein an additional mixture of resin and light aggregate may be located on top of the reinforcement member.

15 27. The method of claim 22 wherein a top surface of the first layer is polished.

28. A structural element comprising:

a first layer of:

an amount of polymer resin;

20 an amount of a light aggregate with a specific gravity less than that of the resin; and

an amount of a heavy aggregate with a specific gravity larger than that of the resin and;

a second layer of:

25 an amount of polymer resin; and

an amount of a light aggregate with a specific gravity less than that of the resin.

29. The structural element of claim 28 wherein one or more reinforcement members are located within the structural element.

30 30. The structural element of claim 29 wherein the reinforcement members are located between the first layer and the second layer.

31. The structural element of claim 30 wherein the reinforcement

member has a series of apertures located through the reinforcement member.

32. The structural element of claim 31 wherein the apertures are sized to allow resin and an amount of light aggregate to pass through the  
5 apertures.